

Application No. 09/720,068
Filed: March 8, 2001
TC Art Unit: 1754
Confirmation No.: 8851

REMARKS

Claims 1-18 are pending in the present application. Claims 12 and 17 are amended herein. New claims 19-35 are added herein. Accordingly, claims 1-35 will be pending upon entry of the instant amendments.

Support for the amended claims can be found throughout the specification and encompassed by the scope of the claims as originally filed. In particular, amendment to claims 12 and 17 have has been made to respond to the 35 U.S.C. §112, second paragraph, rejection as further explained below. Support for the new claims 19-35 can be found at least, for example, from claim 1, its dependent claims, and from claim 15. No new matter has been added.

Any amendments to the claims should in no way be construed as acquiescence to any of the Examiner's rejections and were done solely to expedite the prosecution of the application. Applicant reserves the right to pursue the claims as originally filed in this or a separate application(s).

Claim Rejection - 35 U.S.C. §112

Claims 12 and 17 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for having a range together with a narrow range that falls within the broad range.

Applicant respectfully traverses the foregoing rejection. However, Applicant amended claims 12 and 17 to delete the narrow range and added new claims 19 and 20 to cover the narrower range thereby overcoming the foregoing rejection.

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Claim Rejection - 35 U.S.C. §103

Claims 1-4, 6-8, 10, 11, 13 and 14 are rejected under 35 U.S.C. §103(a) as being obvious over Neuenfeldt et al. (U.S. Patent 5,695,634).

Applicant respectfully traverses the foregoing rejection.

The present claims are directed to regenerating a catalyst, namely a precious metal catalyst supported on an amorphous silica alumina support with an acid in liquid state, and a reduction or oxidation of the impregnated catalyst at a temperature above 200°C (claim 1). Therefore, the invention presents a treatment to a catalyst such that the precious metal particles present on the surface of the catalyst become redispersed thereby making the catalyst reusable. In addition, the newly added claims presented herein are specific to the regeneration of a catalyst that has been used from a process selected from the group consisting of hydrogenation, hydro-isomerisation, hydro-desulfurisation, hydrodewaxing and catalytic reforming (new claim 21).

In contrast, Neuenfeldt et al. is directed to a process for the catalytic treatment of wastewater in which the process also includes regenerating the catalyst. In Neuenfeldt et al.'s treatment of regeneration, during the treatment of the wastewater, the wastewater is treated with hydrogen at from 1 to 10 bar and at from 5°C to 80°C, or from 10°C to 30°C (column 2, lines 46-53, of the '634 patent). The process in Neuenfeldt et al. also includes washing the catalyst with an organic solvent such as ketones, alcohols, ethers, acetone or mixtures of these solvents before or after an acid treatment (column 3, lines 9-21, of the '634 patent). While Neuenfeldt et al. also describes thermal treatments of at least 500°C, it also specifies that it be treated with borohydride solution under thermal conditions (column 3,

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lines 30-33, of the '634 patent). Under these conditions, the process in Neuenfeldt et al. is different from the present invention.

One of ordinary skill in the art would read from Neuenfeldt et al. that this patent involves the process of cleaning precipitate or dirt from the surface of the catalyst and not regenerating the catalyst for an effective redispersion of the precious metal on the catalyst.

Nothing in Neuenfeldt et al. provides the requisite motivation, suggestion or teaching for desiring to make the specific combination of steps used in the regeneration process of a precious metal catalyst as claimed in the present invention. No motivating factor is apparent in the teachings of Neuenfeldt et al. It is apparent that the Examiner is merely selecting various exemplary steps from the cited art and remarks that it makes the claimed invention obvious without providing the motivation or suggestion for a skilled artisan wishing to re-disperse precious metal on a specific support would indeed select those steps. The combination of the features asserted by the Examiner does not *prima facie* lead to the claimed invention.

In Neuenfeldt et al., the treatment with hydrogen takes place in combination with the treatment of wastewater. In contrast, the claimed invention specifies that the treatment of hydrogen should take place at a temperature of at least 200°C, which is plainly inconsistent with the contacting of wastewater with hydrogen and the catalyst to be regenerated. The Examiner tries to resolve this inconsistency by referring to the "thermal treatment," which is not, in and of itself, suggestive of the claimed invention. In the present invention, the thermal treatment takes place in the presence of hydrogen. In the process of Neuenfeldt et al., it

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would inconsistent to add hydrogen in the regeneration step when hydrogen is already introduced with the wastewater. Accordingly, it would not be obvious to come up with the presently claimed invention successfully using the teachings described in Neuenfedt et al. Plainly, an ordinary skilled artisan reading the cited art would absorb ideas for cleaning a catalyst; there is no teaching or suggestion in the art as to redispersing the precious metal on a catalyst as claimed in the present invention. Applicant respectfully requests reconsideration and withdrawal of the foregoing rejection.

Allowable Subject Matter

Applicant gratefully acknowledges the Examiner's assertion that claims 5 and 15-18 are allowable if rewritten in dependent form including all of the limitations of the base claim and any intervening claims.

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CONCLUSION

Based on the foregoing, entry of the amendments and remarks presented herein, reconsideration and withdrawal of all the rejections and allowance of application with all pending claims are respectfully requested.

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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AMENDMENT TO THE CLAIMS

1. (Previously Presented) Process for the regeneration of a catalyst, said catalyst comprising at least one precious metal on an amorphous silica-alumina support, in which process the catalyst is impregnated with an acid in liquid state, followed by reduction or oxidation of the impregnated catalyst at a temperature above 200°C.
2. (Previously Presented) Process according to claim 1, wherein the precious metal is selected from the group consisting of Pt, Pd, Au, Ir, Ru, Rh, Re, Os and Ag, preferably Pt and/or palladium.
3. (Previously Presented) Process according to claim 1, wherein the degree of dispersion is increased after the regeneration.
4. (Previously Presented) Process according to claim 1, wherein the acid impregnated catalyst is reduced in a flow of hydrogen gas.
5. (Previously Presented) Process according to claim 1, wherein the acid impregnated catalyst is oxidised in a flow of dry (<0.1 vol. % of water) air, followed by reduction.
6. (Previously Presented) Process according to claim 1, wherein the reduction and/or oxidizing step are carried out at a temperature of between 250 and 600°C.

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7. (Previously Presented) Process according to claim 1, wherein the silica-alumina support has been prepared using a sol-gel method.

8. (Previously Presented) Process according to claim 1, wherein the support has an Si-Al atomic ratio of from 0.1 to 300.

9. (Previously Presented) Process according to claim 1, wherein the catalyst has a precious metal content of from 0.01 to 5 wt.%, calculated on the basis of the weight of reduced catalyst.

10. (Previously Presented) Process according to claim 1, wherein the catalyst is impregnated with an aqueous solution of the acid.

11. (Previously Presented) Process according to claim 1, wherein the acid is selected from the group consisting of HCl, H₃PO₄, H₂SO₄, HNO₃, HBr and combinations thereof.

12. (Currently amended) Process according to claim 1, wherein the amount of acid calculated on the basis of a ratio equivalents of acid to atoms of precious meal is between 0.1 and 100, preferably between 0.5 and 10.

13. (Previously Presented) Process according to claim 1, wherein prior to the impregnation, carbonaceous deposits on the catalyst are burned off.

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14. (Previously Presented) Process according to claim 1, wherein the regeneration is carried out in a reactor, separate from the reactor in which the catalyst is used.

15. (Previously Presented) Process according to claim 1, wherein the catalyst is used catalyst from a process selected from the group consisting of hydrogenation, hydro-isomerisation, hydro-desulfurisation, hydrodewaxing and catalytic reforming.

16. (Previously Presented) Process for hydrogenation, hydro-isomerisation, hydro-desulfurisation or hydrodewaxing, comprising treating the feedstock in the presence of a catalyst that has been regenerated using the process of claim 1.

17. (Currently amended) Process according to claim 2, wherein:
the degree of dispersion is increased after the regeneration;
the acid impregnated catalyst is reduced in a flow of hydrogen gas;

the acid impregnated catalyst is oxidised in a flow of dry (<0.1 vol.% of water) air, followed by reduction;

the reduction and or oxidising step are carried out at a temperature of between 250 and 600°C;

the silica-alumina support has been prepared using a sol-gel method;

the support has an Si-Al atomic ratio of from 0.1 to 300;

the catalyst has a precious metal content of from 0.01 to 5 wt.%, calculated on the basis of the weight of reduced catalyst;

the catalyst is impregnated with an aqueous solution of the acid;

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the acid is selected from the group consisting of HCl, H₃PO₄, H₂SO₄, HNO₃, HBr and combinations thereof;

the amount of acid calculated on the basis of a ratio of equivalents of acid to atoms of precious metal is between 0.1 and 100, ~~preferably between 0.5 and 10~~;

prior to the impregnation, carbonaceous deposits on the catalyst are burned off;

the regeneration is carried out in a reactor, separate from the reactor in which the catalyst is used; and

the catalyst is a used catalyst from a process selected from the group consisting of hydrogenation, hydro-isomerisation, hydro-desulfurisation, hydrodewaxing and catalytic reforming.

18. (Previously Presented) Process for hydrogenation, hydro-isomerisation, hydro-desulfurisation or hydrodewaxing, comprising treating the feedstock in the presence of a catalyst that has been regenerated using the process of claim 17.

19. (New) Process according to claim 1, wherein the amount of acid calculated on the basis of a ratio equivalents of acid to atoms of precious metal is between 0.5 and 10.

20. (New) Process according to claim 17, wherein the amount of calculated on the basis of a ratio equivalents of acid to atoms of precious metal is between 0.5 and 10.

21. (New) Process for the regeneration of a catalyst, said catalyst comprising at least one precious metal on an amorphous silica-alumina support, in which process the catalyst is impregnated with an acid in liquid state, followed by reduction or

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oxidation of the impregnated catalyst at a temperature above 200°C, wherein the catalyst is used catalyst from a process selected from the group consisting of hydrogenation, hydroisomerisation, hydrodesulfurisation, hydrodewaxing and catalytic reforming.

22. (New) Process according to claim 21, wherein the precious metal is selected from the group consisting of Pt, Pd, Au, Ir, Ru, Rh, Re, Os and Ag, preferably Pt and/or palladium.

23. (New) Process according to claim 21, wherein the degree of dispersion is increased after the regeneration.

24. (New) Process according to claim 21, wherein the acid impregnated catalyst is reduced in a flow of hydrogen gas.

25. (New) Process according to claim 21, wherein the acid impregnated catalyst is oxidised in a flow of dry (<0.1 vol. % of water) air, followed by reduction.

26. (New) Process according to claim 21, wherein the reduction and/or oxidizing step are carried out at a temperature of between 250 and 600°C.

27. (New) Process according to claim 21, wherein the silica-alumina support has been prepared using a sol-gel method.

28. (New) Process according to claim 21, wherein the support has an Si-Al atomic ratio of from 0.1 to 300.

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29. (New) Process according to claim 21, wherein the catalyst has a precious metal content of from 0.01 to 5 wt.%, calculated on the basis of the weight of reduced catalyst.

30. (New) Process according to claim 21, wherein the catalyst is impregnated with an aqueous solution of the acid.

31. (New) Process according to claim 21, wherein the acid is selected from the group consisting of HCl, H₃PO₄, H₂SO₄, HNO₃, HBr and combinations thereof.

32. (New) Process according to claim 21, wherein the amount of acid calculated on the basis of a ratio equivalents of acid to atoms of precious metal is between 0.1 and 100.

33. (New) Process according to claim 21, wherein the amount of acid calculated on the basis of a ratio equivalents of acid to atoms of precious metal is between 0.5 and 10.

34. (New) Process according to claim 21, wherein prior to the impregnation, carbonaceous deposits on the catalyst are burned off.

35. (New) Process according to claim 21, wherein the regeneration is carried out in a reactor, separate from the reactor in which the catalyst is used.